Xtralis VESDA VLS

Product Guide

August 2008
Document Number: 10279_08
Part Number: 19147

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VESDA

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Document Conventions

The following typographic conventions are used in this document.

Convention	Description
Bold	Used to denote: emphasis Used for names of menus, menu options, toolbar buttons
Italics	Used to denote: references to other parts of this document or other documents. Used for the result of an action.

The following icons are used in this document

Convention	Description
	Caution: This icon is used to indicate that there is a danger to equipment. The danger could be loss of data, physical damage, or permanent corruption of configuration details.
	Warning: This icon is used to indicate that there is a danger of electric shock. This may lead to death or permanent injury.
	Warning: This icon is used to indicate that there is a danger of inhaling dangerous substances. This may lead to death or permanent injury.

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Codes and Standards Information for Air Sampling Smoke Detection

We strongly recommend that this document is read in conjunction with the appropriate local codes and standards for smoke detection and electrical connections. This document contains generic product information and some sections may not comply with all local codes and standards. In these cases, the local codes and standards must take precedence. The information below was correct at time of printing but may now be out of date, check with your local codes, standards and listings for the current restrictions.

FCC Compliance Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, the user is encouraged to try to correct the interference by one or more of the following measures; re-orientate or relocate the receiving antenna, increase the separation between the equipment and receiver, connect the equipment to a power outlet which is on a different power circuit to the receiver or consult the dealer or an experienced radio/television technician for help.

FDA

This VESDA product incorporates a laser device and is classified as a Class 1 laser product that complies with FDA regulations 21 CFR 1040.10. The laser is housed in a sealed detector chamber and contains no serviceable parts. The laser emits invisible light and can be hazardous if viewed with the naked eye. Under no circumstances should the detector chamber be opened.

FM Hazardous Applications

3611 Hazardous Approval Warning: Exposure to some chemicals may degrade the sealing of relays used on the detector. Relays used on the detector are marked “TX2-5V”, “G6S-2-5V” or “EC2-5NU”.

VESDA detectors must not be connected or disconnected to a PC while the equipment is powered in an FM Division 2 hazardous (classified) location (defined by FM 3611).

FM Approved Applications

The product must be powered from VPS-100US-120, VPS-100US-220 or VPS-220 only.

ONORM F3014

ONORM F3014, transport times for all tubes (including capillaries) must not exceed 60 seconds from any hole. This means that the pre-designed pipe networks that include capillaries cannot be used.

AS1603.8

The performance of this product is dependent upon the configuration of the pipe network. Any extensions or modifications to the pipe network may cause the product to stop working correctly. You must check that ASPIRE2 approves alterations before making any changes. ASPIRE2 is available from your VESDA ASD distributor.

AS1851.1 2005

Maintenance Standards. Wherever this document and the AS1851.1 differ, AS1851.1 should be followed in preference to this document.

European Installations

The product must use a power supply conforming to EN54: Part 4.

Regional Regulatory Requirements and Notices

UL

For open area protection the fire alarm threshold (signal) that initiates an evacuation procedure via the Fire Alarm Panel must not be set less sensitive than 0.625%/ft. The detector can send this signal via the Fire Alarm Panel Output signal or the Pre-alarm output signal.

EN54-20

The product must use a power supply conforming to EN 54-4.

The product is compliant with EN 54-20 sensitivity requirements provided the following conditions are met:

- For a Class A detector, hole sensitivity must be better than 3.9% obscuration/m and transport time less than 75 seconds
- For a Class B detector, hole sensitivity must be better than 11% obscuration/m and transport time less than 90 seconds
- For a Class C detector, hole sensitivity must be better than 50% obscuration/m and transport time less than 90 seconds

These limits should be verified using ASPIRE2 during the design of the sampling pipe network.

The product is compliant with EN 54-20 flow monitoring requirements provided the following conditions are met:

- The minor low and minor high flow thresholds should be set at 85% and 115% respectively

The flow through the detector predicted by ASPIRE2 should be in the range 20 to 115 lpm

Additional information:

- Class A detectors passed EN 54-20 approvals testing with 40 holes and 0.08% obscuration/m detector sensitivity
- Class B detectors passed EN 54-20 approvals testing with 40 holes and 0.23% obscuration/m detector sensitivity
- Class C detectors passed EN 54-20 approvals testing with 60 holes and 0.65% obscuration/m detector sensitivity

Approvals

- UL
- ULC
- FM
- LPCB
- VdS
- CFE
- ActivFire
- AFNOR
- VNIIPO
- CE - EMC and CPD
- EN 54-20

Regional approvals listings and regulatory compliance vary between Xtralis VESDA product models. Refer to www.xtralis.com for the latest product approvals matrix.

Document: 10279_07
Part: 19147

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1 Scope

This manual is written to provide you with comprehensive knowledge of the detector.

This manual introduces you to the Xtralis VESDA VLS features, technical specifications and gives an understanding of its components and their function. You will also find instructions on installing, cabling and powering up the detector.

This manual is for anyone involved with the design, maintenance and purchasing of an Xtralis VESDA system. It is assumed that anyone using this manual has knowledge and the appropriate certification from the local fire and electrical authorities.

2 Introduction to the VLS

The VLS can monitor and individually report on four sectors in the protected area.

The VLS is an aspirating smoke detector providing very early warning of fire conditions by drawing air samples through an air sampling pipe network. The detector chamber can detect presence of smoke at very low concentrations. The embedded and PC software complimenting the VLS provides a wide range of user defined parameters and reporting capabilities. The detector easily interfaces with fire warning and fire suppression release systems, and can be easily integrated into a building management system.

Features of the VLS

The VLS features make it a versatile smoke detection product:

- Wide sensitivity range 0.005% obs/m to 20.0% obs/m (0.0015% obs/ft. to 6.24% obs/ft.)
- Each detector can cover an area of up to 2,000 m^2 (20,000 sq. ft.)
- Four programmable alarm thresholds (Alert, Action, Fire 1 and Fire 2)
- AutoLearn feature
- Four pipe inlets
- Individual pipe flow monitoring
- Scans individual sectors once smoke has been detected
- Replaceable air filter cartridge
- Option for inverted mounting
- Recessed mounting option
- Modular to meet site specific requirements
- Modular Display Module and LCD Programmer
- Programmable relays (option for 7 or 12 relays available)
- High efficiency aspirator
- Programmable General Purpose Input (GPI) to invoke operational modes
- PC programming and monitoring
- Multilingual displays
- Event Log for up to 18,000 events

3 Operation of the VLS

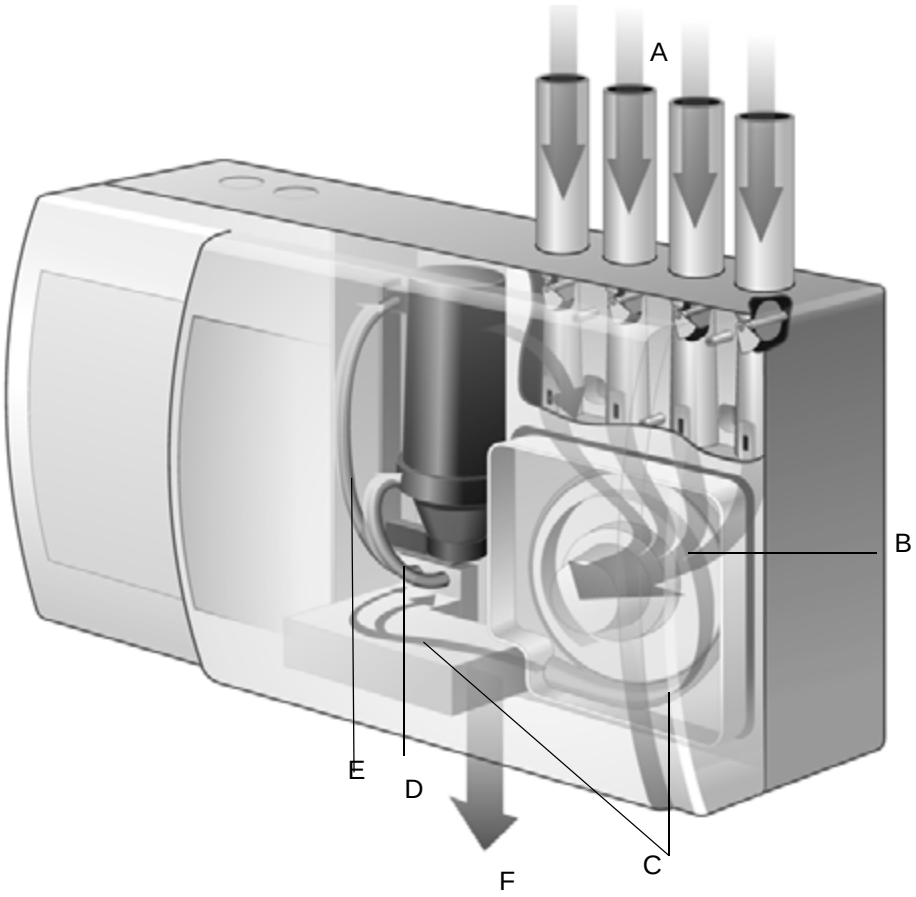
An air sampling pipe network with sampling holes at appropriate spacing collects air samples from a protected area.

An integrated Aspirator draws air in the sampling pipes through a Pipe Inlet Manifold (up to four pipes can be connected to a VLS detector). For further information on air sampling pipe network please see the Pipe Network Design and Installation Manuals.

Each pipe inlet in the manifold has a valve that can open or close the flow of air to the pipe. The scan function controls the opening and closing of the valves to detect the smoke carrying pipe. See *The Scanning Function* on page 6 for further information.

Some of the sampled air flows to the dual stage air filter. The first stage filtration removes dust and dirt from the sampled air and a small percentage of this air then flows to the laser detector chamber for detection smoke.

Any smoke detected in the laser detection chamber is signaled to the main processor card. If the presence of detected smoke is higher than the set thresholds it will be reported as an alert, action, fire 1 or fire 2 Alarm depending upon the set alarm thresholds. The second stage filtration further filters the air to make it ultra clean air. The ultra clean air is used to protect the optical surfaces in the laser detector chamber.



Legend	
A	Air inlets from pipe networks
B	Air is drawn into the aspirator
C	Some air is filtered and:
D	-flows into the chamber for testing
E	-is filtered a second time, then used to flush the chamber with ultra clean air
F	All air is then exhausted

Figure 1 - Operation and internal air flow of a VLS

The Scanning Function

The VLS is designed to sample air from different sectors and to identify through a scanning process the sector reporting presence of smoke.

Scanning

During normal operation the scanner valves remain open and the VLS draws air from all the pipes. When smoke is detected at a higher level than the scan threshold, for a period exceeding the configured scan delay (0 to 10 seconds), the detector performs a fast scan. During the fast scan operation the VLS samples air from each sector (pipe) separately by controlling the scanner valves in the inlet manifold. The fast scan sequence for each pipe is approximately 4 seconds.

The sector reporting the highest level of smoke above the alert threshold is designated as the first alarm sector. The display modules assigned to the detector reports this by illuminating the first alarm and alert LEDs, and displaying the corresponding pipe number on the numeric screen.

Having identified the first alarm sector, the VLS performs a slow scan using intelligent sequencing. The sector with the highest level of smoke (the first alarm sector) is scanned first. Each of the other sectors is scanned one at a time. Intelligent sequencing scans the first alarm sector in every alternate scan (e.g. if all the pipes are in use and pipe 1 corresponds to the first alarm sector then intelligent sequencing will scan Pipe 1,2,1,3,1,4,1,2.....). The time spent sampling air in each sector depends upon the configured sector time.

Adaptive scan threshold

The scan threshold is the configured threshold at which the detector commences scanning once smoke has been detected at the threshold. The VLS performs an adaptive scan process to automatically set scan thresholds at the optimized level. The adaptive scan threshold process is explained below:

- Typically separate scan thresholds are set for day and night periods.
- Scan thresholds are initially set to the lowest day or night alert threshold divided by the number of pipes. If the threshold is set by AutoLEARN, the day or Night Alert Threshold is divided by 2.
- The scan thresholds are then adapted automatically to eliminate unnecessary and excessive scan cycles.
  - **Adapting the scan threshold upwards -** When the detected smoke level is lower than the configured Alert Threshold, the scan threshold increases upwards by 0.005% obs/m 0.0016% obs/ft.) with every fast scan cycle. It will continue to do so until the scan threshold is above the ambient smoke level or it equals the Alert Threshold. The scan threshold cannot exceed the Alert Threshold
  - **Adapting the scan threshold downwards -** At every changeover time (from Day to night and from night to day) the detector determines if it is necessary to adapt the scan threshold downwards. Thus, if the scan threshold has been adjusted upwards, then in the following 24 hour period the detector begins a process of gradually lowering the scan threshold downwards to an optimum setting. The detector maintains a record of the maximum smoke readings measured in each day (or night) period. At the start of the next day (or night) period the scan threshold is automatically scaled downwards by calculating the difference between the current scan threshold and the maximum smoke reading for the previous day (or night) period.

The Scanner Valve Test

The VLS performs a scanner valve test when first powered up. Thereafter a valve test is performed every alternate Tuesday at 12:00 hours. During the valve test each valve is individually closed and opened to ensure its proper functioning. Any improper functioning is reported as a fault (refer to the Xtralis VESDA Troubleshooting Guide for fault descriptions and troubleshooting). It is possible to simulate a valve scan test by pressing the **Silence/Scan** button on the Display Module for two seconds, or selecting the scan test option under the diagnostics menu on the LCD programmer or the device menu on the PC software.

Sector Factor

By setting appropriate sector factors it is possible to set different alarm thresholds for each of the four sectors. The detector uses the sector factor to automatically calculate the alarm thresholds appropriate for each sector based on the configured alarm thresholds. These are *multiplied* by the sector factor to set the sector alarm thresholds.

Guidelines for setting sector factors:

- Sector factors range between 0.5 and 2.0
- Where more sensitive protection is desired for a sector (for example a critical server room where there are relatively more sampling holes and restricted access), set the sector factor at less than 1.0
- Where less sensitive protection is desired for a sector (for example where there is a risk that a particular local process will generate nuisance alarms), set the sector factor at greater than 1.0
- As a general rule, the difference between all pipes should not be greater than 1

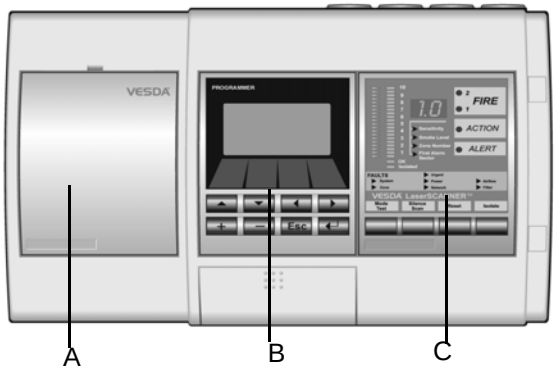
Sector factors are generally optimized after a detector has been operational for a period and sufficient historical data has been gathered in the event log to assist the decision. However, if it is required to pre-determine the appropriate setting for sector factor the following methodology can be used:

- Use ASPIRE2 Pipe Modelling Software to model the intended pipe layout
- Determine the appropriate fire sensitivity required for each sector to achieve the desired hole sensitivity in each sector
- Select an appropriate median setting for the Fire 1 threshold to be configured in the detector and calculate the appropriate sector factor which, when multiplied by the configured Fire 1 threshold, will give the desired fire sensitivity for each pipe
- Record the desired Fire1 threshold setting and sector factor setting for configuration into the detector at commissioning.

VLS Configurations:

One or more devices can be integrated with the VLS detector. These are normally configured at the factory prior to shipping, but can also be installed at a later time. The standard VLS comes with 7 relays or in an optional 12 relay version. The modules that can be integrated are:

- Display Module
- LCD Programmer Module
- Fire and OK LEDs (FOK) Module

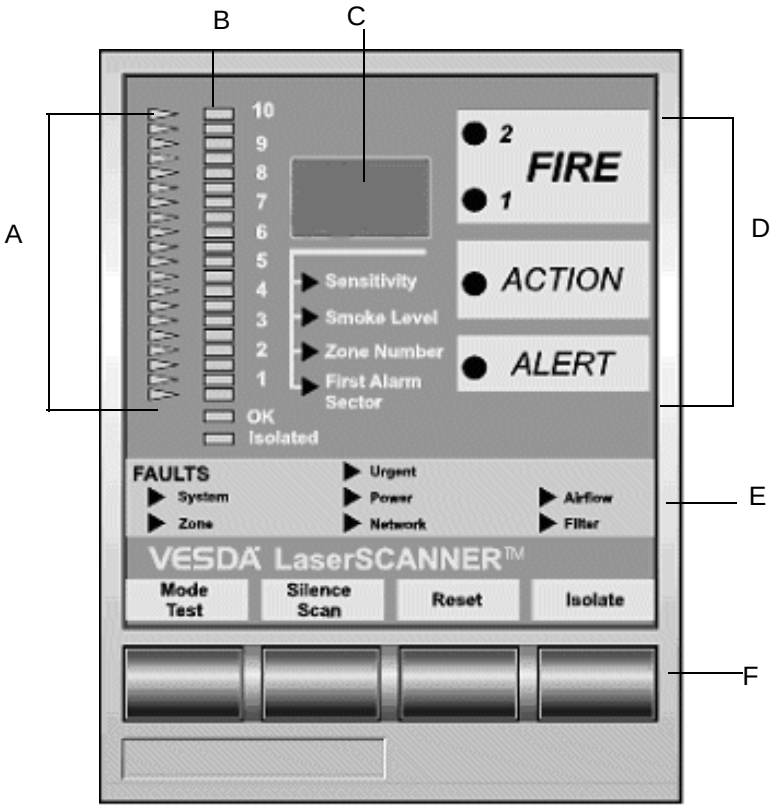


Legend	
A	Blank Plate
B	LCD Programmer
C	VLS Display Unit

Figure 2 - VLS-214 with 7 relays, blank plate, LCD Programmer and Display Module

Display Module

The VLS Display Module is mounted either on the detector front cover or at a remote location in a remote mounting box or a 19” subrack. It provides a visual representation of the smoke levels and the four alarm stages for the assigned detector. An array of fault LEDs light up in different configurations to report Urgent, Minor, Zone and System faults. Up to 20 Display Modules can be assigned to one detector, however the Display Module can be configured to report the status of only one detector at a time.



Legend	
A	Threshold Indicators
B	Bar graph
C	Numerical Display
D	Alarm Level LEDs
E	Fault LEDs
F	Push Button Keys

Figure 3 - VLS display module

OK LED The OK LED stays lit during normal operation indicating the unit is functioning normally. When this LED is off a warning beep sounds, indicating a Fault condition is active.

Isolate LED This LED is lit when the detector is Isolated and relays are de-activated disabling alarm outputs of the detector. The display can be programmed to beep every 60 seconds.

Alarm Levels

ALERT: When lit this LED indicates that the smoke level is above the alert threshold. This means the detector has identified very early stages of a fire condition and/or that the smoke level in the area is above normal.

ACTION: When lit this LED indicates that the detected smoke level has passed the threshold value fixed for Action, but is not intended to initiate a general fire alarm response procedure.

FIRE 1: When lit this LED indicates that the detected smoke level is above the threshold value set to initiate a general fire alarm response procedure. This indicates a fire may be imminent or is in progress. When interfaced with a Fire Alarm Control Panel (FACP) it can generate an automatic fire alarm.

FIRE 2: When lit this LED indicates a fire is in progress. The detector can be interfaced with an FACP to activate automatic suppression systems and evacuation procedures.

Bar graph

The Bar graph is a 20 step indicator where each indicator represents an increase in the detected level of smoke, relative to the preset fire alarm level.

Threshold Indicators

The illuminated LEDs represent visual settings for ALERT, ACTION, and FIRE 1 alarm levels. The FIRE 1 indicator is always at the top.

Fault LEDs

The Fault LEDs illuminate to indicate:

URGENT: A serious fault requiring immediate attention

SYSTEM: A fault affecting the network to which the Display module is connected

ZONE: A fault in the VESDA Zone monitored by the Display module

POWER: A fault in the power supply if the GPI function is used

NETWORK: A communications fault on VESDAnet

AIRFLOW: Higher or lower than acceptable levels of air flow through the inlet pipe(s)

FILTER: The air filter requires changing

Push Button Keys

These buttons enable various systems functions. These do not allow configuring the system. The buttons can be disabled by the systems administrator.

Mode/Test (Dual Function): Selects modes on the numerical display - sensitivity, smoke level, or zone number. When depressed for more than 2 seconds it performs a light test function.

Silence/Scan (Dual Function): This button has dual functions. It silences any alarm or fault warnings. Any LEDs flashing to indicate an alarm condition or a fault will stop flashing. When pressed for two seconds it initiates a Scan Test.

Reset: Resets any latched alarms and faults on the detector. Any active alarms or faults are reported again after the time delays have elapsed.

Isolate: Isolates the detector from any external devices or systems (an isolate alarm will normally be raised at the fire alarm control panel).

Note: It is recommended practise to signal the Isolate condition to the Fire Control Panel using the Isolate relay.

Numerical Display

Sensitivity: Shows the level of smoke that must be measured to illuminate the entire bar graph and always corresponds with the Fire 1 alarm level.

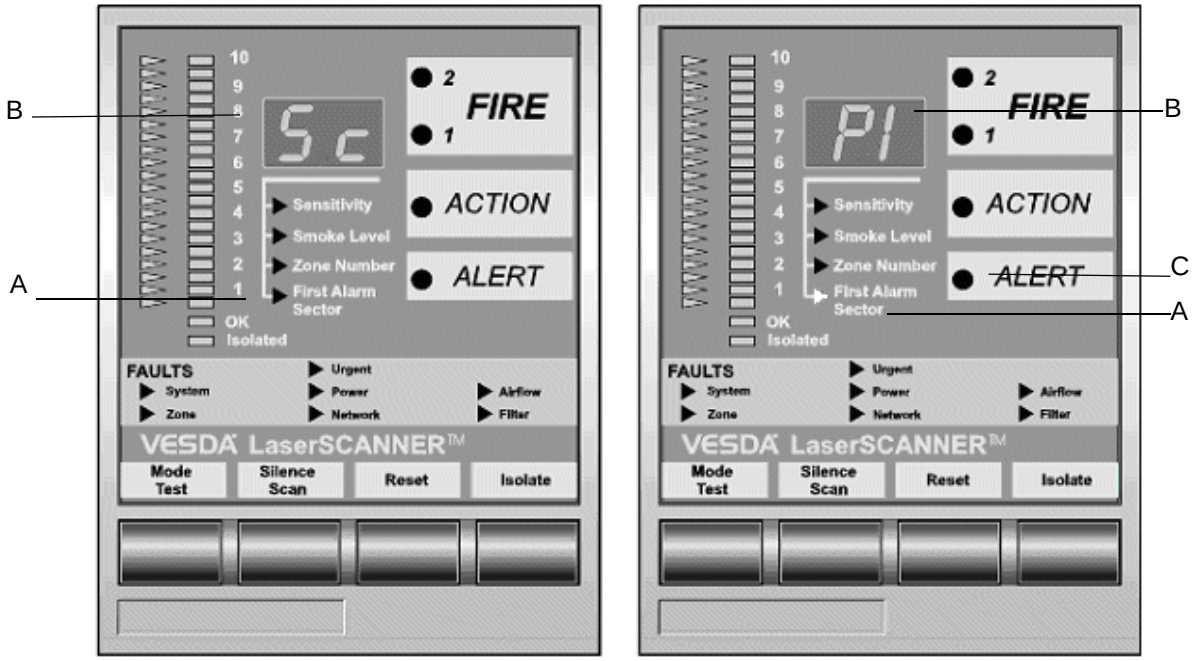
Smoke Level: Indicates the current level of smoke in the relevant VESDA Zone and is represented as % obs/m or % obs/ft.

Zone Number: This is the VESDA Zone number assigned to the Display Module.

First Alarm Sector: This is the pipe with the highest level of smoke and is represented with a “P” followed by the pipe number.

Note: The Mode button is used to select the parameter to display in the numeric display. These values represent the current readings for the corresponding parameters mentioned alongside the lit LED.

Display during the scan process



VLS in a scan mode

VLS immediately after a fast scan mode if a fire condition is generated

Legend	
A	FAS indicator
B	Numeric display
C	Alert alarm light

Figure 4 - The Display Module when the VLS is in a scan mode and immediately after the scan mode has been completed

Xtralis VESDA LCD Programmer

The LCD Programmer is used for configuring, commissioning and maintenance of the devices on VESDAnet. It can replace either the center or the right plate of the front cover of the detector, or can be mounted at a remote location. A hand-held model is also available. The hand-held model is connected to the VESDAnet socket on the termination card of the detector. For a detailed description and use of the LCD Programmer please refer to the Xtralis VESDA LCD Programmer Product Guide.

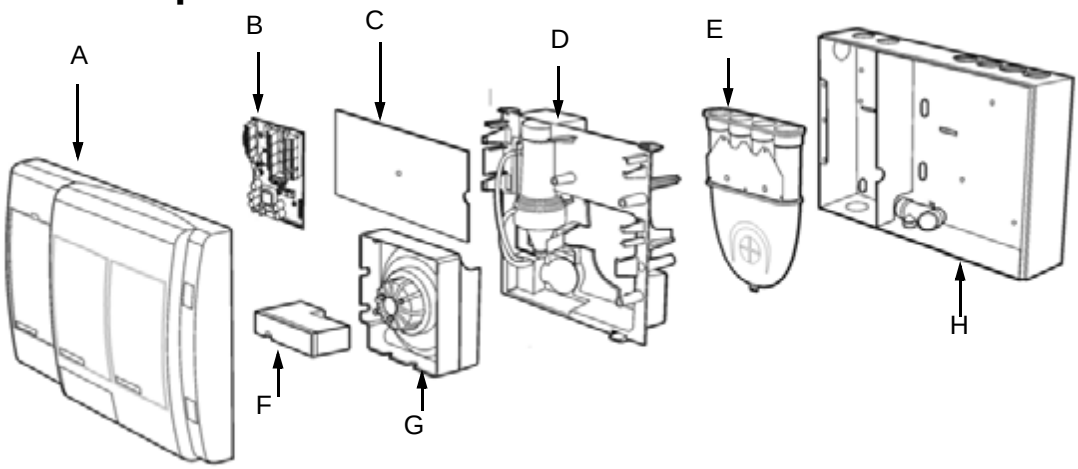
The LCD Programmer can be configured to a particular VLS Zone. If so programmed, the LCD Programmer automatically displays the relevant sector information for individual sectors when it is scanning.

.

Legend	
A	Display
B	Keys

Figure 5 - LCD programmer

VLS Components



Legend			
A	Front Cover	E	Pipe Inlet Manifold
B	Termination Card	F	Air Filter
C	Blank Card Protecting Processor Card	G	Aspirator
D	Chassis with Laser Detector Chamber	H	Mounting Box/Enclosure

Figure 6 - An exploded view of the detector

4 VLS Product Information

Product Specifications

Supply Voltage	18 to 30 VDC
Power Consumption	@24 VDC
VLS with Blank Plates 3,000rpm	Normal: 5.8 W Alarm On: 7.4 W
VLS with Blank Plates @ 4,200rpm	Normal: 9.6 W Alarm On: 12 W
Programmer Module	Normal: 0.6 W (Backlight Off) Alarm On: 2.2 W (Backlight On)
Display Module	Normal: 1.6 W Alarm On: 2.2 W
Dimensions (WHD)	350 mm x 225 mm x 125 mm (13.8 in x 8.9 in x 4.9 in)
Weight	4.0 kg (9 lbs) including Display and Programmer Modules
Operating Temperature **(To operate the VLS detector outside these parameters please contact your nearest Xtralis VESDA Technical Office)**	Detector Ambient: UL tested: 0° to 39° C (32° F to 103° F) Sampled Air: -20° to 60° C (-4° to 140° F) Humidity: 10-95% RH, non-condensing
Storage Temperatures (Non-operational)	Up to 2 years (battery life). 0° to 85°C Dry (<95% humidity) 0° to 85° C Must not be exposed to sunlight or other radiation sources
Sampling Pipe Network	Maximum length per pipe 100 m (328 ft) Aggregate pipe length: 200 m (650 ft) Pipe Modelling Design Tool: ASPIRE™
Pipe Size	Internal Diameter: 15-21 mm (9/16 - 7/8 in) External Diameter: 25 mm (1 in) (25 mm to 1 inch adaptor supplied for USA market)
Relays	7 or 12 relays option. Contacts rated 2A @ 30 VDC Programmable to latch or non-latch states.
Relays Default Configuration	7 relays: Alert, Action, Fire 1, Fire 2, Minor Fault, Urgent Fault and Isolate. (7 x NO/NC contacts) 12 relays: Alert, Action, Fire 1, Fire 2, Minor Fault, Urgent Fault and Isolate, First Alarm sector 1 to 4 and Scan. (10 x NO, 2 x NO/NC contacts)

Scan Sector Delay (Period)	Minimum 8 seconds, maximum 15 seconds
Scan Threshold Delay	Minimum 0 seconds, maximum 10 seconds
IP Rating	IP30
Cable Access	8 x 25 mm (1in) knockouts in various positions
Cable Termination	Screw terminal blocks (0.2-2.5 sq mm, 30-12 AWG)
Sensitivity Range	0.005 to 20% obs/m (0.0015 to 6.25% obs/ft.)
Threshold Setting Range	Alert: 0.005 - 1.990% obs/m (0.0015 - 0.6218% obs/ft.) Action: 0.010 - 1.995% obs/m (0.0031 - 0.6234% obs/ft.) Fire 1: 0.015 - 2% obs/m (0.0046 - 0.625% obs/ft.) Fire 2: 0.020 - 20% obs/m (0.0062 - 6.25% obs/ft.)** ** Limited to 12% obs/m 4% obs/ft. in UL mode All shipments are factory configured for UL Mode. If the UL Mode is switched OFF the UL listing will be voided.
Key Software Features	
Event log:	Up to 18,000 events stored on FIFO basis
AutoLearn:	Minimum 15 minutes Maximum 15 days, 23hrs, 59 minutes Recommended minimum period 14 days During AutoLearn, thresholds (i.e. alarm thresholds) are NOT changed from pre-set values
Referencing:	Compensation for external ambient conditions
Four Alarm Levels:	Alert, Action, Fire 1 and Fire 2
Two Fault Warning Levels:	Minor Fault and Urgent fault
Software Programmable relays:	7 or 12
Maintenance Aids:	Filter and flow monitoring Event reporting via VESDAnet or event log
Auto Scan and Threshold Settings:	Detector selects the appropriate scan threshold automatically

VLS Dimensions

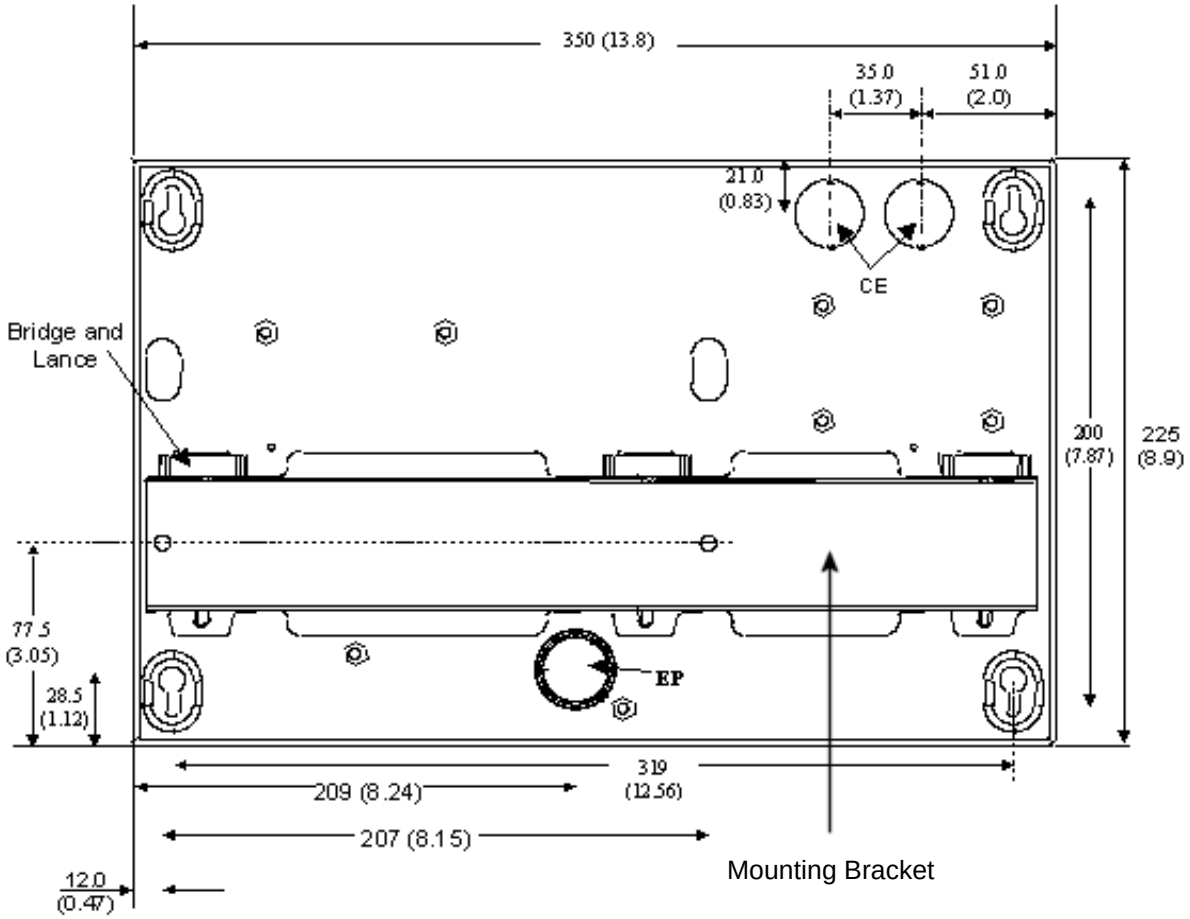


Figure 7 - VLS *dimensions - rear view*

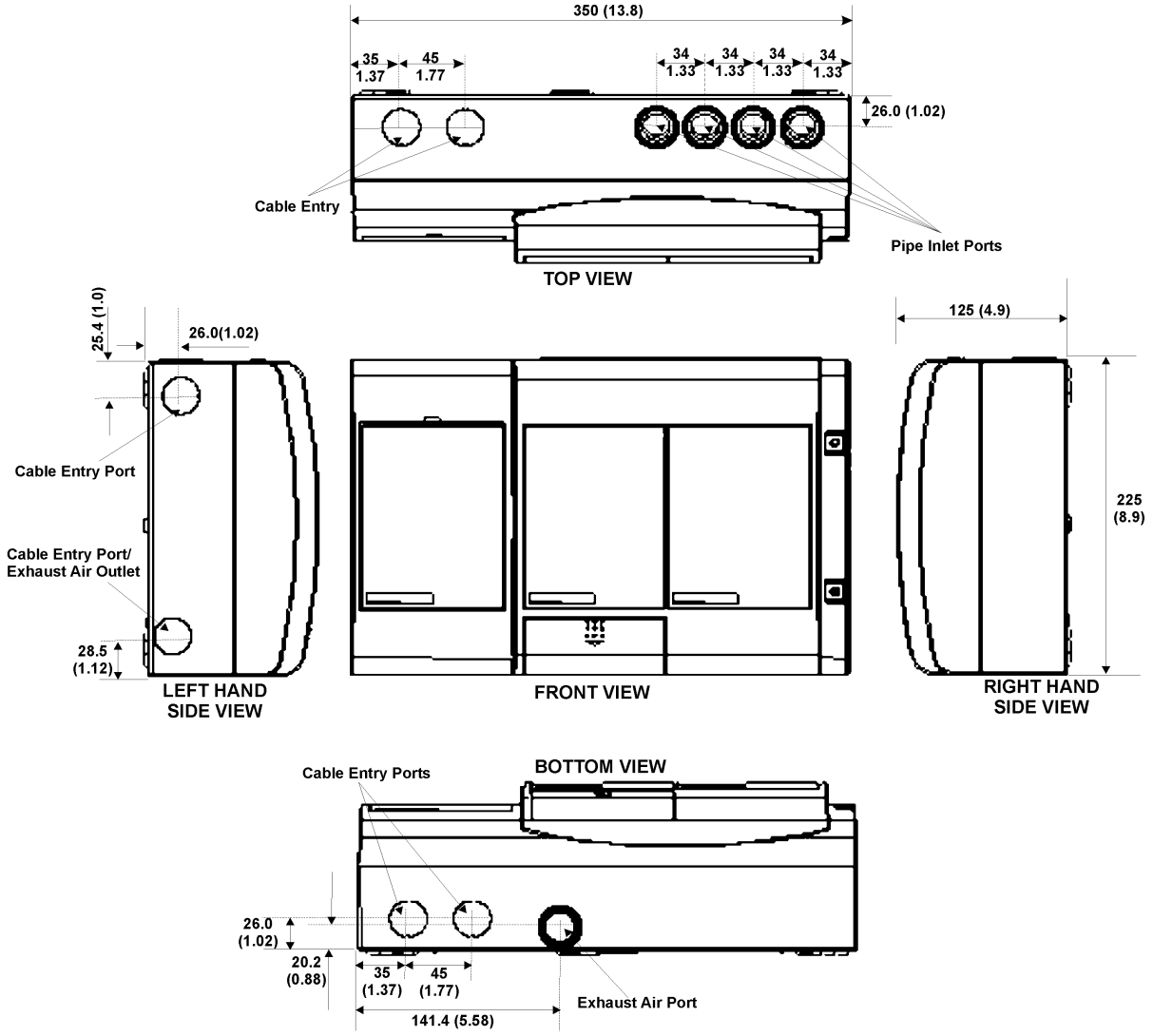


Figure 8 - VLS *dimensions*

Default Settings

Parameter	Default Value	Range		Access Level
		Minimum	Maximum	
Airflow Delay	0 seconds	0	60 seconds	Adm
• High Urgent	130%	105%	200%	Adm
• High Minor	120%	105%	200%	Adm
• Low Minor	80%	25%	95%	Adm
• Low Urgent	70%	25%	95%	Adm
Aspirator Speed	3,000 rpm	3,000 rpm	4,200 rpm	Adm
AutoLearn	14 days 0 Hours 0 Minutes	0 Days 0 Hours 15 minutes	15 days 23 Hours 59 Minutes	Adm Adm Adm
Display Mode	Smoke level	NA	NA	Usr
Display Button Lockout…Buttons	Enabled	NA	NA	Adm
Communications: Open-ended loop Preferred Port Network Delay Health Check	 None A 15 seconds 45 seconds	NA 10 seconds 40 seconds	NA 45 seconds 60 seconds	 Adm Dst Dst Dst
Day Start	07:00:00	NA	NA	Adm
Night Start	19:00:00	NA	NA	Adm
Device ID	Name & Number	NA	NA	Adm
Event Log to View	Smoke Level Alarms Faults User Action	NA	NA	Adm Adm Adm Adm
Faults Latched	Latched	NA	NA	Adm
Filter Service Interval	731 days (2 years)	1 Day	3655 days (10 years) Clean Room	Adm
Alarms Latched	Latched	NA	NA	Adm
Alert Threshold	0.08% obs/m 0.025% obs/ft.	0.005% obs/m 0.0015% obs/ft.	1.99% obs/m 0.6218% obs/ft.	Adm
Action Threshold	0.14% obs/m 0.044% obs/ft.	0.010% obs/m 0.0031 obs/ft.	1.995% obs/m (0.6234 obs/ft.	Adm
Fire 1 Threshold	0.2% obs/m 0.0625% obs/ft.	0.015% obs/m 0.0046% obs/ft.	2% obs/m .6250% obs/ft.	Adm

Parameter	Default Value	Range		Access Level
		Minimum	Maximum	
Fire 2 Threshold	2% obs/m 0.625% obs/ft.	0.02% obs/m 0.0062% obs/ft.	20% obs/m 6.25% obs/ft.	Adm
Isolate Reminder Beep	On	NA	NA	Adm
Reference detector:				
Reference Zone No.	255	Selectable	Selectable	Adm
Dilution	100%	1%	100%	Adm
Delay	2 minutes	0 minutes	15 minutes	Adm
Hardware Relays	7	7	12	Adm
Scan Sector Delay	10 seconds	8 seconds	15 seconds	Adm
Scan Threshold	0.02% obs/m 0.0062% obs/ft.	NA	NA	
Scan Threshold Delay	3 seconds	0 seconds	10 seconds	Adm
Smoke Change... Change By	0.02% obs/m 0.0062% obs/ft.	0.005% obs/m (0.0015% obs/ft.	1.990% obs/m (0.6218% obs/ft.	Adm
Smoke Change... Minimum Interval	2 seconds	2 seconds	10 seconds	Dst
UL Version	On	Selectable	Selectable	Adm
Units	SI	Selectable	Selectable	Adm
Weekend	Saturday and Sunday	Selectable	Selectable	Adm

Table 1 - Default settings and permissible thresholds

Relays

The relays on the Head Termination card interface to Fire Alarm Control Panels communicating faults, alarms and isolate states. The relays can be programmed using PC based software or the LCD Programmer and can be assigned multiple assignments. See the LCD Programmer Manual for details. Relays 3 and 6 are permanently set for Urgent Fault and Fire 1 respectively and can be programmed for additional functions. The table below illustrates default assignments for relays and assignment of multiple functions. It is possible to assign the same function to more than one relay.

Note: Assignments to relays 3 and 6 are fixed to Urgent Fault and Fire 1 respectively. These relays may be assigned additional assignments.

Relay Settings and Conditions to Change States

Relay #	Default	State change	Latch
1	Isolate	Energizes when an operator isolates the detector by pressing the **Isolate** key on the Display Module or by activating the command via a PC or a LCD Programmer or GPI option.	Unlatched
2	Minor Fault	De-energizes when a Minor Fault is detected.	Latched
3	Urgent Fault	De-energizes when an Urgent Fault is detected.	Latched
4	Alert	Energizes when the Alert alarm is initiated in any sector.	Latched
5	Action	Energizes when the Action alarm is initiated in any sector.	Latched
6	Fire 1	Energizes when the Fire 1 alarm is initiated in any sector.	Latched
7	Fire 2	Energizes when the Fire 2 alarm is initiated in any sector.	Latched
8	first alarm sector 1	Energizes when the first alarm sector 1 has been identified	Latched
9	First alarm Sector 2	Energizes when the first alarm sector 2 has been identified	Latched
10	First alarm Sector 3	Energizes when the first alarm sector 3 has been identified	Latched
11	First alarm Sector 4	Energizes when the first alarm sector 4 has been identified	Latched
12	Scan	Energizes when the Scanner is scanning the inlet ports.	Latched

Table 2 - Relay settings and conditions to change state for 7 and 12 relays head termination card

Relay default settings

Relay	1	2	3	4	5	6	7	8	9	10	11	12
Isolate	**a**											
Minor Fault		**a**										
Urgent Fault			**a**									
Alert Sector 1				**a**								
Alert Sector 2				**a**								
Alert Sector 3				**a**								
Alert Sector 4				**a**								
Action Sector 1					**a**							
Action Sector 2					**a**							
Action Sector 3					**a**							
Action Sector 4					**a**							
Fire 1 Sector 1						**a**						
Fire 1 Sector 2						**a**						
Fire 1 Sector 3						**a**						
Fire 1 Sector 4						**a**						
Fire 2 Sector 1							**a**					
Fire 2 Sector 2							**a**					
Fire 2 Sector 3							**a**					
Fire 2 Sector 4							**a**					
first alarm sector 1								**a**				
first alarm sector 2									**a**			
first alarm sector 3										**a**		
first alarm sector 4											**a**	
Scanning												**a**

Table 3 - Table showing the default settings for relays

Note: A **a** represent the Default Relay Settings. Relays 3 and 6 are permanently configured for Urgent Fault and Fire 1 (any sector) respectively. All other relays can be re-configured. Multiple functions can be attached to a relay provided the combined voltage does not exceed 5 VDC.

First alarm sector relays:

The first alarm sector relays are Factory set at Default to relays 8, 9, 10 and 11 (See “Relay settings and conditions to change state for 7 and 12 relays head termination card” on page 19. These relays are activated once the sector assigned to the relay has an event where the alert alarm is first activated. Once the first alarm sector relay has been activated on one sector, the first alarm sector relays for other sectors will not be activated unless the system is reset.

General Purpose Input (GPI) Functions

The input terminal requires a voltage supply between 5V and 30 VDC to operate. The input is isolated from the system by an opto-coupler device. Connect the GPI + terminal to the positive output and the GPI - terminal to the ground output of the external device. The GPI can be configured to initiate a number of different actions - including, by default, a Remote Reset function. The GPI can be configured through the 'Miscellaneous' screen menu of the LCD programmer. See the LCD Programmer Product Guide for details.

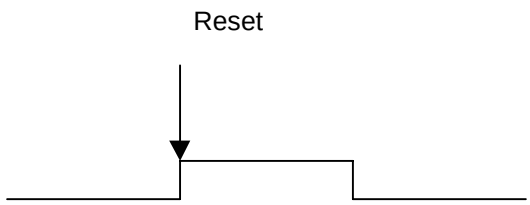
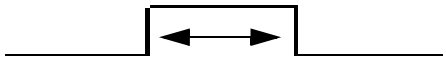
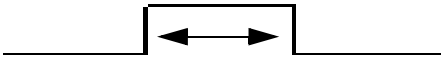
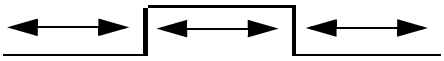
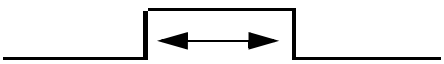
Function	State change	
External Reset	Detector Reset when ≥ 5 VDC is at this terminal.	
Mains OK	The detector monitors the state of the external power supply and responds to the following conditions. Mains OK ≥ 5 VDC at this terminal Mains Fail ≤ 2 VDC at this terminal	
Standby Mode	The detector Isolates and the aspirator turns OFF when ≥ 5 VDC is at this terminal **Note:** No Alarms can be generated in this state	
Isolate	The detector isolates when the voltage rises above 5 VDC and De-isolates when the voltage falls below 5V.	
Use Night-time Threshold	The detector switches over from day-time to night-time thresholds when ≥ 5 VDC are at these terminals.	
Reset+ Isolate	While power is applied to the GPI the detector is isolated. In addition, the disconnection or connection of power to the GPI resets the unit. ≥ 5 VDC detector isolates ≤ 2 VDC detector reset	
Inverted Reset	This is the reverse of the normal reset function. ≤ 2 VDC detector reset ≥ 5 VDC normal operating mode	

Table 4 - GPI Functions

Note: The signal voltage into the GPI terminals must be between 5 to 30 VDC. The logic input states are not defined for any voltages >2 to < 5 VDC at the GPI terminals.

Note: When the detector is isolated or de-isolated as a GPI function, the status cannot be changed through the normal isolate/de-isolate functions of the Display Module or the LCD Programmer. When using the Standby or Remote Isolate options it is recommended that all displays on VESDAnet are configured to have the isolate button disabled.

Note: When the night-time threshold is configured as a GPI function, it overrides the clock settings for day-start and night-start.

5 Mounting the VLS

The VLS can be mounted onto the wall or on any suitable secure surface using the mounting bracket. It is **strongly recommended** that the detector is mounted on to the mounting bracket included with the packaging. Determine the cable entry ports and the air exhaust port before mounting the detector. Consideration should also be given to the positioning of the pipe inlet ports in relation to the existing pipe network.

Caution: Press out the relevant knockouts taking care **not to damage** the relays and terminals on the termination card.

Securing the mounting bracket

The orientation required for the VLS will determine how the mounting bracket is placed. To secure the mounting bracket to the mounting surface place the flat side against the surface ensuring that the lances do not sit flush to the surface. The figure below illustrates the bracket position for normal and inverted orientations. Secure the mounting bracket to the surface using appropriate fasteners, ensuring that the bracket is horizontally straight and sits flush on the surface.

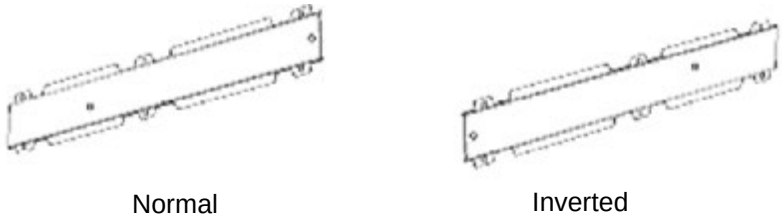


Figure 9 - The mounting bracket in normal and inverted orientation

Mounting the VLS detector in Normal Orientation

Place the three bridges located at the rear of the detector onto the lances of the mounting bracket. Push downwards until it locks onto the lances and engages the fitting dimples. To prevent unwanted removal of the detector, secure the detector to the mounting surface by placing two screws through the keyhole slots situated near the termination card.

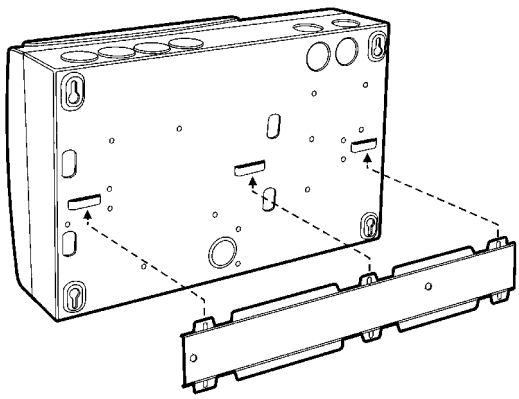


Figure 10 - Mounting the VLS onto the mounting bracket

Mounting the VLS in the inverted orientation

If the detector is fitted with a LCD Programmer and/or a Display Module, reorient these to the inverted position. Mount the detector in inverted orientation onto the mounting bracket.

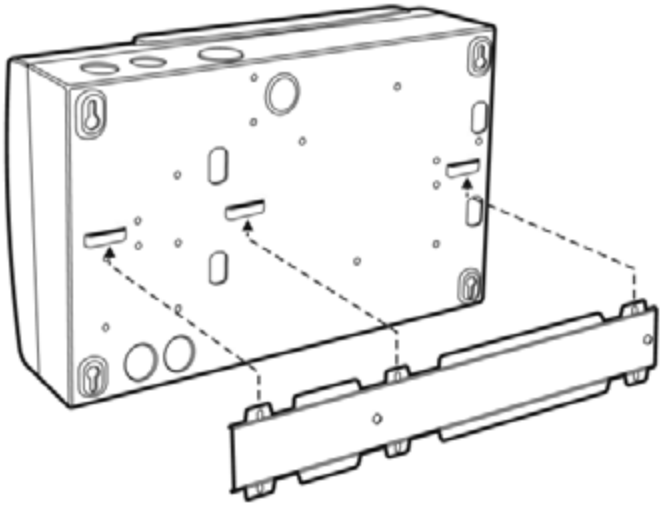


Figure 11 - Mounting the VLS detector *in inverted orientation onto the mounting bracket*

Mounting the VLS without mounting bracket

In the event the detector has to be mounted directly onto the mounting surface, remove the chassis from the mounting box. See *Replacing the chassis/Air Inlet Pipe Manifold* on page 37 for details.

Use the four keyhole slots to secure the mounting box to a flat surface, ensuring that it is horizontally straight. Re-install the chassis into the mounting box. Carefully re-connect the looms and complete the cabling prior to closing the front cover. See “Internal Wiring for VLS” on page 39.

Note: The detection chamber, head processor card and flow sensors are factory calibrated as a matched set. Separating the set and replacing it with components from another set may cause the detector to malfunction, requiring re-calibration at the factory.

Recess mounting kit

These kits are used to house a detector inside a wall cavity.

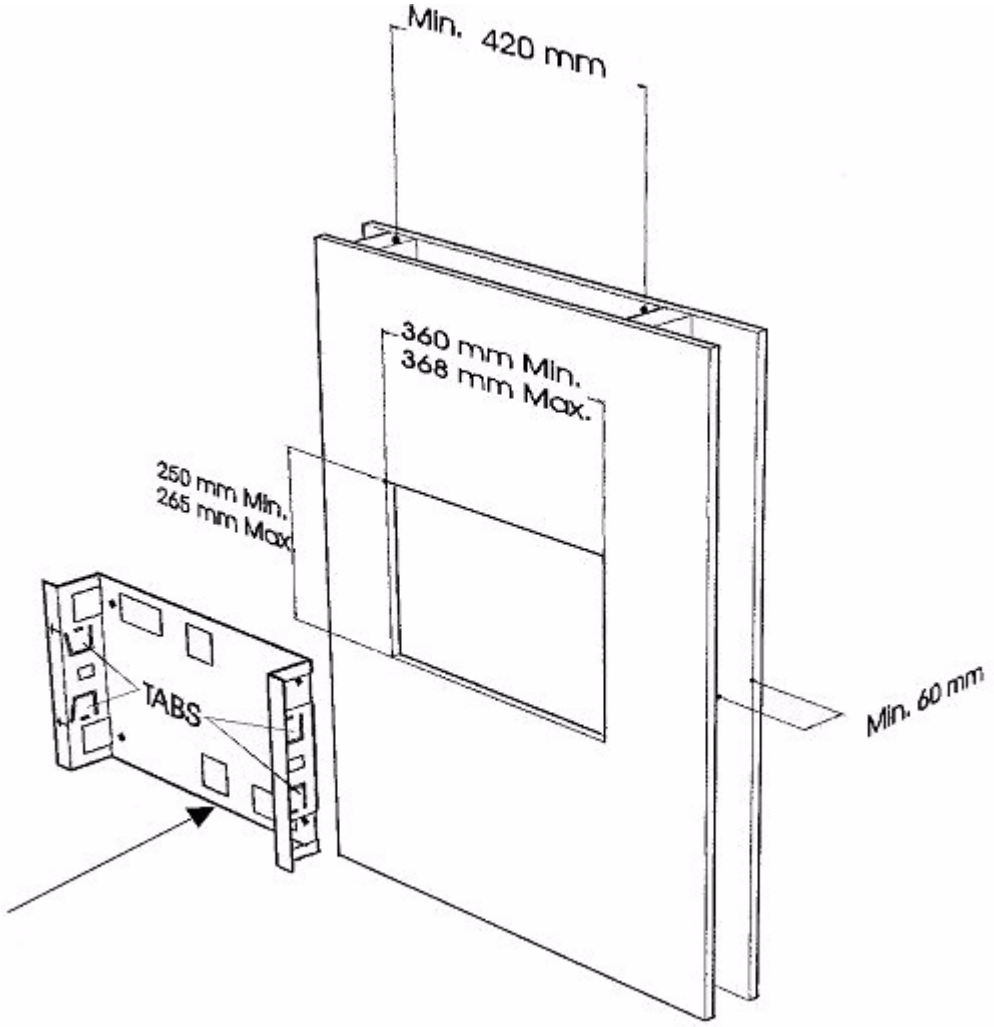


Figure 12 - Recess mounting kit

6 Connecting to the Pipe Network

Inlet Pipes

The inlets in the pipe inlet manifold are designed to receive a standard pipe of 25 mm (1 in) OD. A 25 mm to 1.050 inches adaptor to fit the pipe inlet manifold is included for all shipments to USA.

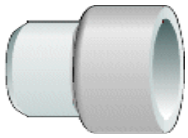


Figure 13 - Pipe Adaptor

The design of the air inlet ports allow insertion of the sampling pipe to a depth of 15 mm (0.60 inch). This prevents the sampling pipes from damaging the flow sensors. While connecting the detector to the pipe network:

- Ensure a minimum length of 500 mm (19.7 in) of straight pipe before terminating the pipes at the air inlet ports of the detector.
- Square off and de-burr the end of the sampling air pipes, ensuring the pipes are free from swarf.
- Determine the Air Inlet Ports to be used. See Table 5 on page 26 for details.
- Remove the plugs from **only** those Air Inlet Ports intended for use.
- Insert the pipes into the pipe inlet(s) ensuring a firm fit.

Note: **DO NOT** glue the inlet pipes to the pipe inlet manifold.

When configuring the detector ensure that the correct pipes in use are selected.:

No. of Pipes	Preferred Pipe Inlet Port to Use			
	Pipe 1	**Pipe 2**	**Pipe 3**	**Pipe 4**
1		**a**		
2		**a**	**a**	
3		**a**	**a**	**a**
4	**a**	**a**	**a**	**a**

Table 5 - Preferable use of pipe inlet ports

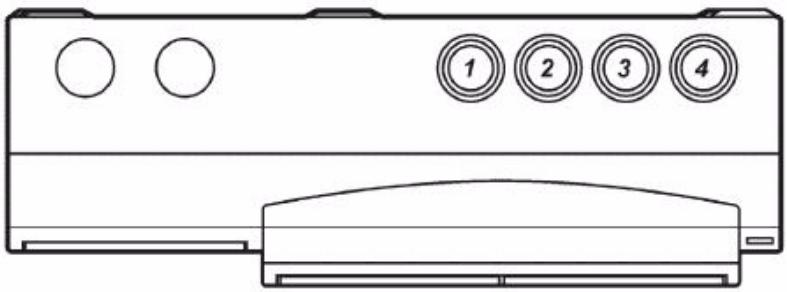


Figure 14 - Pipe inlet port numbering

Managing the Exhaust Air

To exhaust air from the detector, use the exhaust ports at the rear or at the bottom of the head mounting box. Remove the appropriate exhaust port plugs and if required, connect an outlet pipe to the exhaust manifold. In the event the side port is used as an air exhaust port, press out the knockout hole. Remove the plug on the exhaust manifold, located at the divider of the chassis and the termination card. Run a 25 mm (1 inch) pipe through the side port and insert into the exhaust manifold, ensuring it is a tight fit.

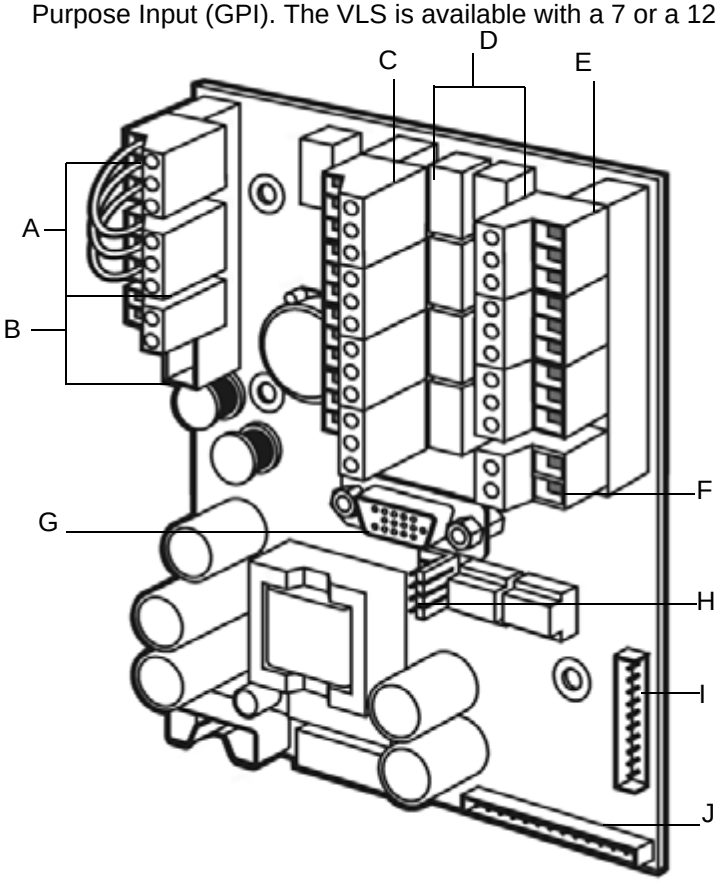
Note: *DO NOT* glue this pipe to the exhaust manifold.

Note: Some applications may require the air exhausted from the detector to be returned to the sampling area.

7 Wiring Connections

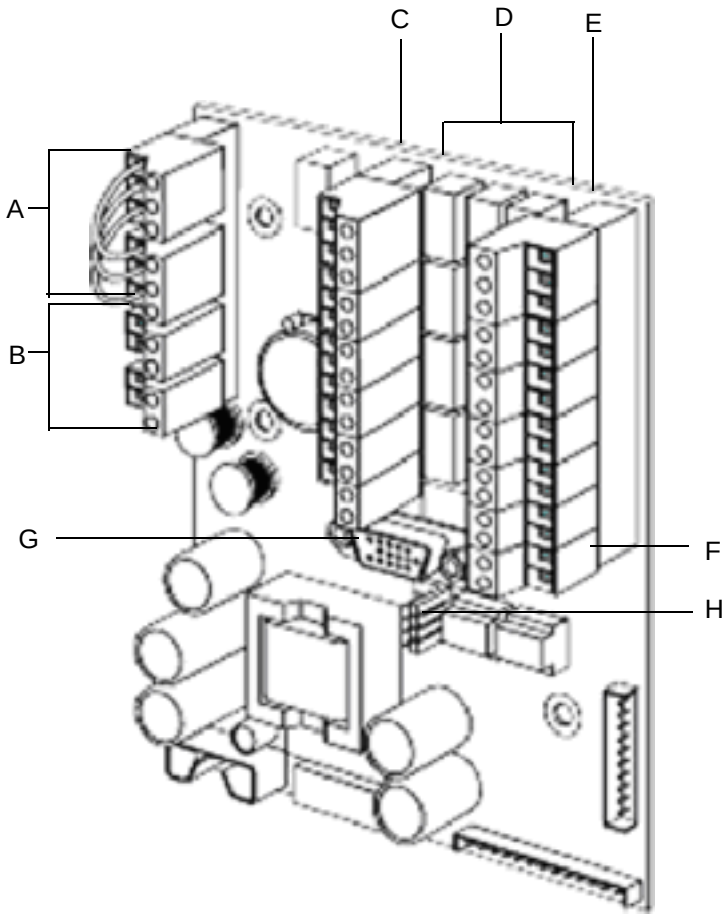
The Termination Card

The termination card acts as the interface for VESDAnet, power supply, relays and the General Purpose Input (GPI). The VLS is available with a 7 or a 12 Relay termination card.



Legend	
A	VESDAnet terminals
B	Power terminals
C	Relay terminals (1 to 4)
D	Relays (1 to 7)
E	Relay terminals (5 to 7)
F	GPI terminal
G	VESDAnet socket
H	FOK LED connectors
I	Relays cable
J	Termination cable

Figure 15 - The terminal card



Legend	
A	VESDAnet Terminals
B	Power Terminals
C	Relay Terminals (3,1,2,4,5, and 7)
D	Relays (1 to 12)
E	Relay Terminals (8,9,10,11,12 and 6)
F	GPI Terminal
G	VESDAnet Socket
H	FOK LED Connectors

Figure 16 - Optional 12 relays terminal card illustrating relays and termination points

VESDAnet Terminals

VESDAnet is a bidirectional data communication network between connected Xtralis VESDA devices. VESDAnet cables are terminated at the VESDAnet A and B Terminals on the termination card. Communication wires from another Xtralis VESDA device are brought into the detector at one terminal and looped out to another device on VESDAnet from the other terminal. It is necessary to maintain the polarity throughout the network. It is recommended that RS 485 (Belden 9841 - 120 Ohm) twisted pair cables, or similar cables be used.

The VLS is shipped with the VESDAnet A and B terminals looped. If the detector is not to be networked with other devices, then do not disturb this loop. Remove this loop to connect the detector to the VESDAnet.

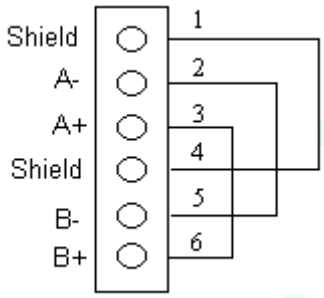


Figure 17 - Stand -Alone VESDAnet Connection

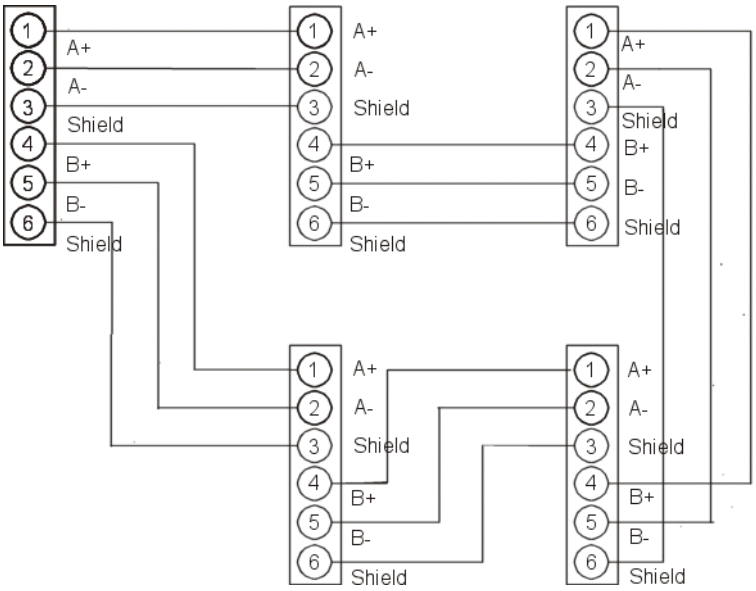


Figure 18 - An example of the wire connection for VESDAnet (closed loop for illustrative purposes only)

Connections for GPI

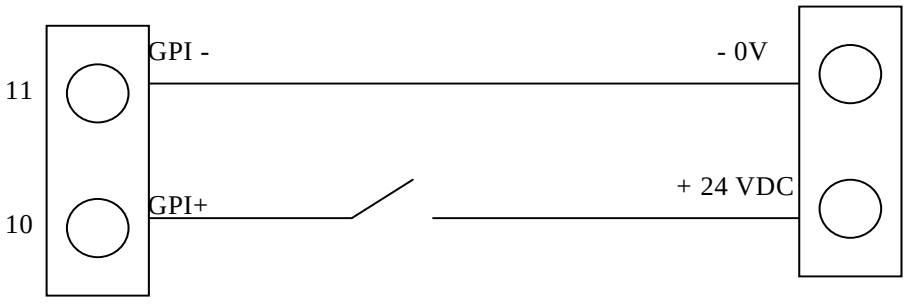


Figure 19 - Wire connection details (GPI)

Typical Wiring To Fire Alarm Control Panel (FACP)

The diagram below shows the correct way to wire Xtralis VESDA laser detectors to a conventional fire alarm control panel (FACP). It also shows where an End Of Line (EOL) resistor is correctly installed.

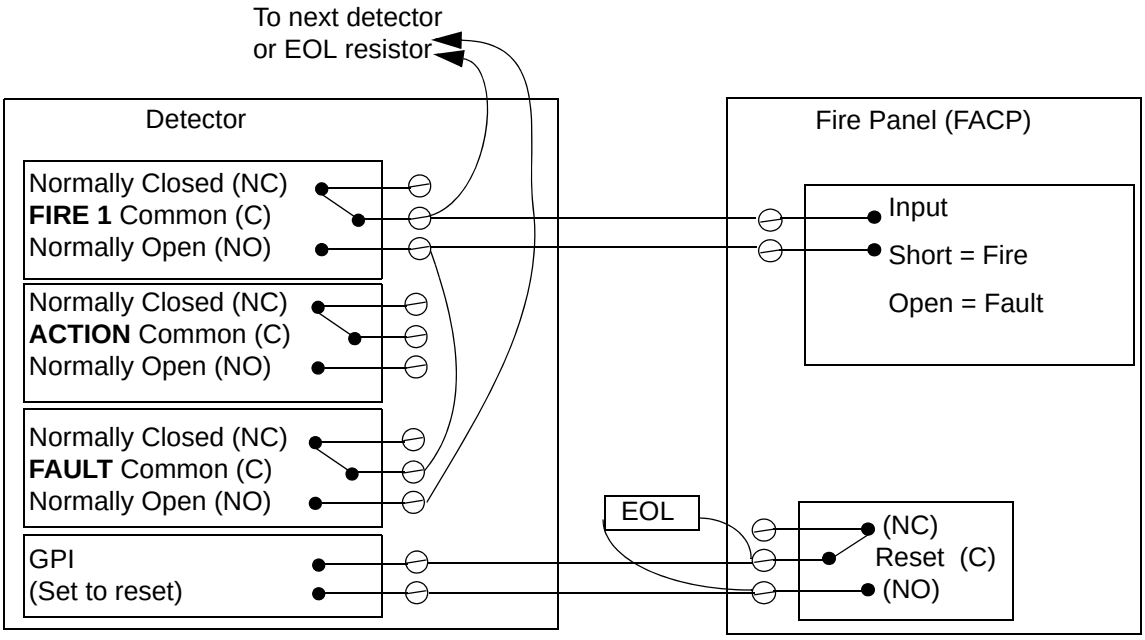


Figure 20 - Typical wiring to a fire panel with EOL

Wiring To an Address Loop Module.

This wiring example is for wiring Xtralis VESDA detectors to a typical Address Loop module 3 input 1 output. These are example drawings. Refer to the appropriate product manual for the exact wiring details of the third party equipment.

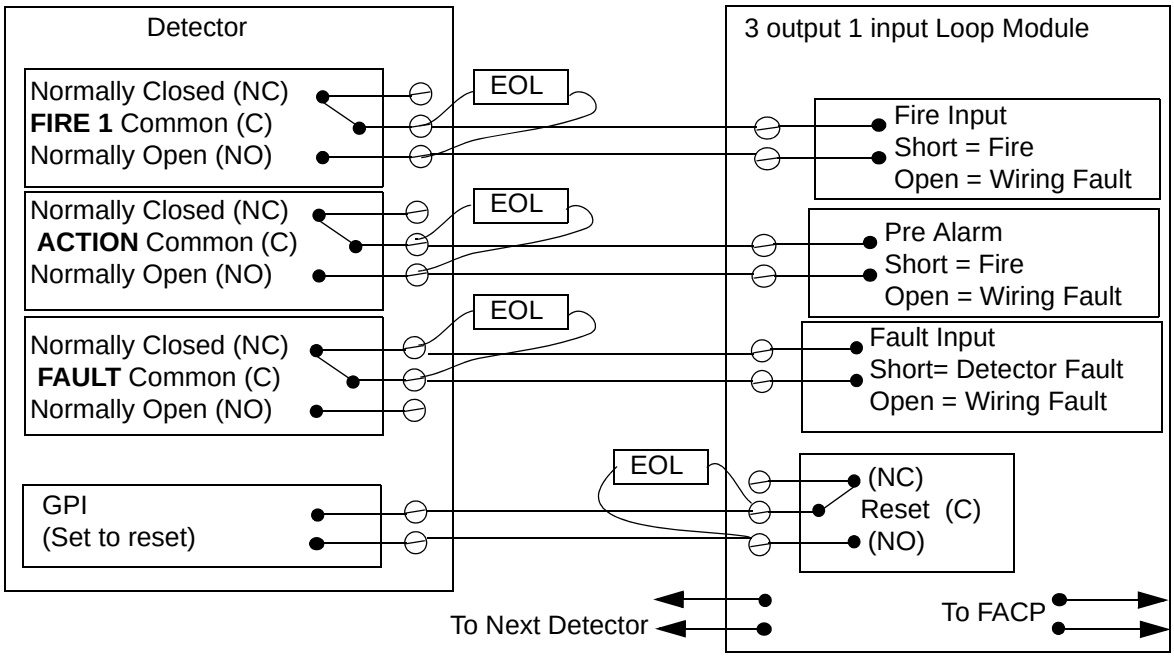


Figure 21 - Addressable Loop Module with EOL

8 Power Source

There are two sets of power terminals on the termination card. Use one of the power terminals on the termination card to connect to a 24 VDC power supply and if necessary loop out to another device via the second set. The detector has reverse polarity protection to minimize the risk of reverse power connection to the detector.

Note: Regional differences in power supply may impact on power connection. Please contact your Regional Xtralis technical support for more information.

Note: Operating the detector when DC supply voltage is outside the voltage range of 18 VDC and 30 VDC may cause damage to the device.

Note: The VLS detector will not operate when the supply is reversed.

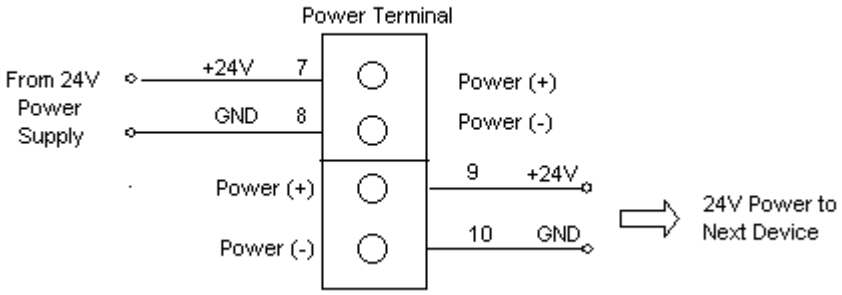


Figure 22 - Wire connection details for power terminals on relays termination card

9 Back Up Battery Power

The power supply for the VLS is switched to a back up battery in the event of a mains power supply disruption. The size of the back up battery is determined by local standards and codes, the total power required by the system, back up time required, allowance for reduction in capacity with age and expected temperature variations.

Note: It is recommended that batteries be inspected and changed as per manufacturer's specifications or as per your local codes and standards.

To facilitate the calculation of the backup battery size a Battery Calculation Sheet is presented on the next page.

	NORMAL LOADS @ 24 V DC			FULL ALARM LOADS @ 24 V DC		
EQUIPMENT	**LOAD mA**	**QTY**	**TOTAL**	**LOAD mA**	**QTY**	**TOTAL**
Detector @ 3000rpm	240			290		
Detector @ 3500rpm	280			330		
Detector @ 4000rpm	350			400		
Detector @ 4200rpm	400			500		
Integral Display	60			80		
Integral Programmer	20 (backlight off)			80 (backlight on)		
Remote Display 7 relays (VRT-400)	90			110		
Remote Display 12 relays (VRT-800)	110			240		
Remote Programmer (VRT-100)	50 (backlight off)			110 (backlight on)		
Hand-held Programmer (VHH-100)	50 (backlight off)			110 (backlight on)		
Systems relay Module (VRT-S07)	60			105		
Remote termination card - 7 relays (VRT-500)	60			105		
Other 24V loads						
		Total mA			Total mA	
	Standby Hours			Alarm Hours		
	Standby Capacity			Alarm Capacity		
				Total Capacity = Standby + Alarm		
				Divided by 1000 for Standby Capacity		
				Multiply by battery factor X1.25		

Table 6 - Calculating the size of backup battery

Note: If intelligent Xtralis VESDA power supply is fitted it will report power failures (F15) on VESDA*net*. VLP & VLS with GPI terminals connected will maintain their aspirator speed for an hour after the loss of mains power. After which, the aspirator speed will be limited to 3000 rpm to conserve power.

10 Starting Up

After installing the VLS detector it is necessary to power up the system:

The system takes approximately 15 seconds to power up

If the system fails to power up, check all power wires are secured to its terminals and the polarities of the power wires are correctly terminated

On power up:

- The aspirator starts up and air is felt flowing out of the exhaust port
- If a programmer module is fitted, the word “VESDA” will be displayed
- If a Display Module is fitted, the following indicators are lit:
  - Fire Alarm Threshold indicators
  - Smoke Threshold indicators on bar graph
  - Two digit numerical display
  - Various fault indicators if there are any faults
  - System OK indicator if there are no faults

If any of the above does not happen, contact your commissioning engineer or distributor to troubleshoot.

Note: It is normal for the detector to display troubles immediately after power up. Reset the detector by pressing the reset button on the front cover of the detector to unlatch the relays and fault LEDs. The fault LEDs on the front cover will illuminate. Proceed with the preliminary systems check.

Installation Checklist

Site Name	
Address	
Detector Serial Number(s) and Date of Manufacture	
Interface Card Serial Number & Date of Manufacture	
Name of Installer	
Signature	
Date	

Perform the following checks listed below to ensure that all the necessary items are completed before handing over to a commissioning engineer.

INSTALLATION CHECKS	**Yes**	**No**
1. Were the detector and the mounting bracket intact in the box?		
2. Is the detector securely locked onto its mounting bracket? Note that the two mounting bracket securing-screws are provided in a separate bag with the detector.		
3. Is the sampling air pipe firmly connected to the air inlet port? Ensure the pipe is NOT glued.		
4. Have the power wires been connected to the correct terminals on the detector?		
5. If required, has the end of line resistor been connected?		
6. Have the alarm signalling wires been terminated to the correct terminals of the detector?		
7. Has the Interface card been correctly installed according to the instructions provided (if applicable)?		
8. Has the plug at the exhaust port been removed and the exhaust pipe (if fitted) not glued?		
9. Has the front cover been replaced correctly?		
10.Has AutoLearn Flow and AutoLearn Smoke been performed? Please state the AutoLearn Smoke period_____		
11.Is the air sampling pipework installed and checked as per the site plans?		

Table 7 - Installation Checklist

11 Preliminary Systems Check

A preliminary systems check is required after installing the VLS detector, before it is commissioned for use. The check can be conducted by connecting the detector to a LCD Programmer or using VSC, or VSM4 PC based software. The preliminary systems check includes:

- Conducting a VESDAnet communications check
- Selecting pipes in use
- Accepting factory default configurations, or changing to site requirements
- Normalizing the air flow
- Conducting a basic pass/fail smoke test
- For details on preliminary systems check refer to the LCD Programmer or the relevant software manuals

Refer to the VESDA LCD Programmer and Commissioning Guides for further details.

12 Maintaining the VLS

To maintain the VLS at its peak performance the maintenance schedule given below should be followed. Maintenance can be conducted by the original installer, an Xtralis VESDA distributor or an approved service contractor. To work effectively the VLS detector needs to be supported by a well designed Pipe Network. The Maintenance Schedule includes the maintenance required for the Pipe Network. Given below is a suggested Maintenance Schedule for the VLS detector. Local codes and standards, and site conditions take precedence in preparing a Maintenance Schedule.

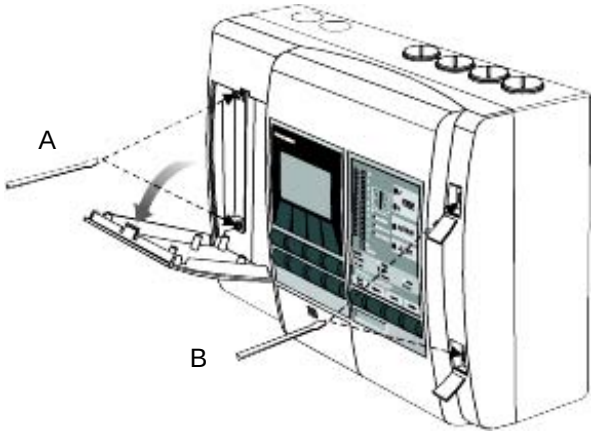
Maintenance Check	Quarterly	Six Monthly	Annual	Every Two Years
Power Supply	a			
Check Pipe Network		a		
Filter Inspection			a	
Pipe Integrity Smoke Test			a	
Check Pipe Flow			a	
Clean Sampling Points				a
Flush Pipe Network				a

Table 8 - Suggested maintenance schedule for VLS detector

Caution: While a VESDA Zone is isolated for maintenance, no fire warnings will be issued by the detector and any fire will go undetected. Prior to any maintenance or testing:
Inform appropriate supervising authority about the risk associated with isolating a VESDA Zone.
Check to see if the detector is also being used by third party.
Ensure that any ancillary devices dependent on the VLS detector are enabled by the isolation before work is begun.

Replacing the chassis/Air Inlet Pipe Manifold

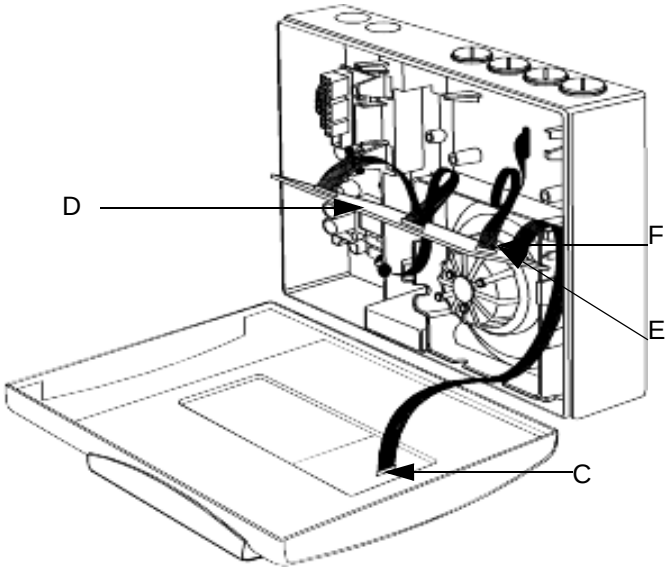
1. Isolate the VLS by pressing the **Isolate** button or by selecting **Isolate Zone** from the **Zone** menu in VSC or VSM4. This isolates the outputs from the unit to a fire alarm panel and other third party devices such as building management systems.
2. If you are using VSC or VSM4, highlight the detector in the Device Tree Window and select the **Device** menu, then **Save Node Configuration.** This will save the configuration details of the VLS.
3. Remove the front panel by using a flat ended screw driver to open the cover plate (A) and screw covers (B), then unscrew the front cover.



Legend	
A	Cover plate screws
B	Screw covers

Figure 23 - Removing Front Cover

4. Either let the front cover hang on the plastic retainer straps, or take it off by disconnecting the retainer straps and the termination cable loom where it connects to the front cover (C).
5. Turn off the power by disconnecting the power cables. Power terminals can be seen on *The terminal card* on page 28.
6. Unscrew the PCB head processor card (D), lift up and disconnect the **flow sensor** (E) and **scanner** (F) cables from the card.

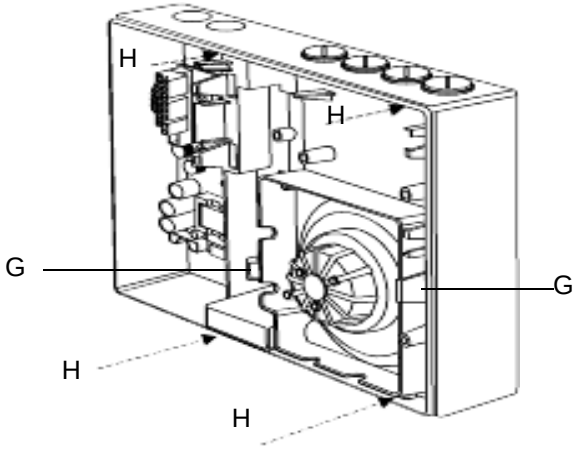


Legend	
C	Termination cable
D	Head processor card
E	Flow sensor cable
F	Scanner cable

Figure 24 - Remove Data cables

7. On the terminal card, disconnect the **Termination** and **Relays** cables. For details see *The terminal card* on page 28.

8. Unscrew the two manifold retaining screws (G).



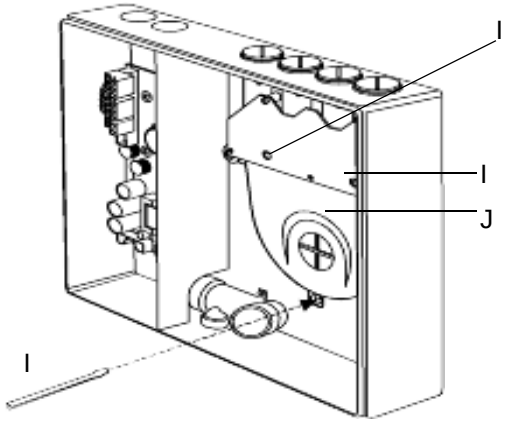
Legend	
G	2 Manifold retaining screws
H	4 Retaining tabs

Figure 25 - Remove the chassis

9. The manifold is held in place by four tabs (H). Use a flat head screw driver to lever out the tabs near the head termination card, and lift up that end of the manifold. While holding the manifold up, use the screw driver to lever out the other two tabs. This is a tight fit. As you lift out the manifold note that the flow sensor and scanner cables disappear through a hole in the manifold. Once the manifold has been lifted out you can see that these cables are still connected to the flow sensor board on the air inlet pipe manifold.

Note: The chassis consists of the detection chamber, head processor card and flow sensors. These are factory calibrated as a matched set and must not be separated. separating the set and replacing it with components from another VLS will cause the detector to malfunction. This will require the chassis to be returned to the factory.

10. Unscrew the three screws holding the pipe inlet in place (I). Two screws are hidden in holes in the PCB (Flow sensor board).
11. Lift the air inlet up and out.



Legend	
I	3 Pipe-inlet retaining screws
J	Pipe inlet manifold

Figure 26 - Removing pipe inlet manifold

12. Attach the replacement manifold and chassis by reversing the procedure above.
13. Configure the VLS using VSC or VSM4 by highlighting the detector in the **Device Tree Window** and selecting **Restore Node Configuration** from the **Device Menu**, or reprogram the detector manually using the LCD Programmer

Note: Power cables must be the last to be connected. Connecting the power cables before all of the data cables can lead the unit to malfunction, requiring the VLS to be returned to the factory.

Internal Wiring for VLS

The table below provides the cable loom interconnecting details inside the detector. Use the look up table in conjunction with the attached circuit diagram to assist with maintenance.

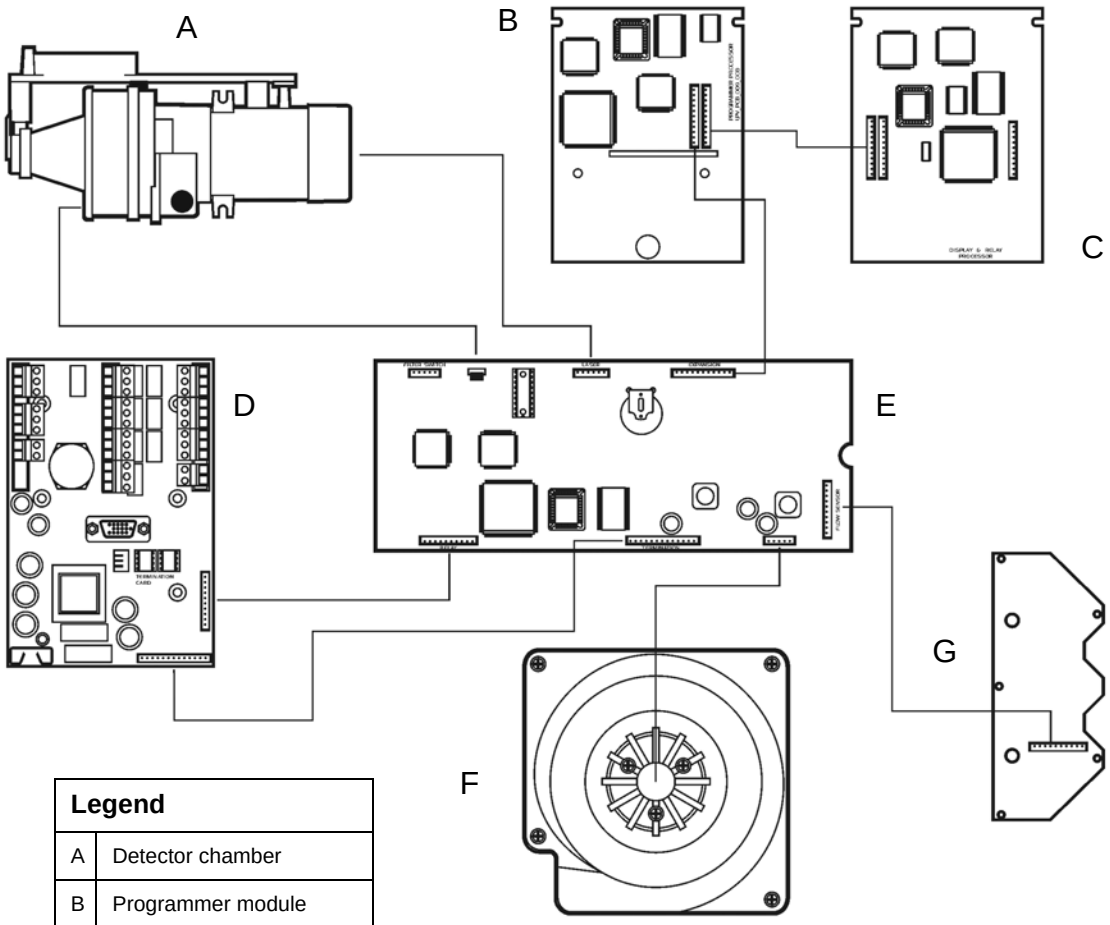
From	To	Connector card and CPU card	CABLE NAME	# PINS
CPU card	Scanner connector on scanner valves	Scanner or X4	Scanner cable	10
CPU card	Scanner connector on sensor card	Flow sensor or X5	Flow sensor cable	10
CPU card	Filter Switch Card	Filter switch or X12	Fail SW	5
CPU card	Termination or X1 connector on termination card	Termination or X1	Termination	13
CPU card	Relays or X2 connector on termination card	Relays or X3	Relays	10
CPU card	Detection chamber	Pre-amp or X9	Pre Amp	6 Wire ribbon
CPU card	Detection chamber	Laser or X10	Laser	6
CPU card	Aspirator	Aspirator or X11		5
CPU card	Term or X1 connector on programmer or display	Expansion or X2		11

Table 9 - VLS Internal Wiring

Note: Do not disconnect the cable running between the CPU card and the detection chamber.

Note: All connectors are polarized and can only be inserted one way into its socket.

Note: Do not attempt to force the connector into its socket. If there is any difficulty, reverse the orientation of the connector before inserting again.



Legend	
A	Detector chamber
B	Programmer module
C	Display module
D	Detector terminal card
E	Processor card
F	Aspirator
G	Flow sensor card

Figure 27 - Internal wiring diagram

Spare Parts

On larger sites having multiple detectors it is advisable to stock certain critical spare parts. A list of spare parts with quantities required is given below:

Part No.	Description	Number of detectors Installed to warrant ONE spare part	
		Normal Service	Mission Critical
VSP-000	Blank Plate, non-EMC painted, with VESDA logo	NA	NA
VSP-001	LCD Programmer	50	20
VSP-004	Display Module	50	20
VSP-005	Filter Cartridge	20	10
VSP-009	VLS Detector chassis assembly complete with manifold	50	20
VSP-011	Recess Mounting Kit for VLP	If applicable	If applicable
VSP-013	Detector cover assembly complete with EMC shields	NA	NA
VSP-014	7-relay termination card (if applicable)	50	20
VSP-015	VLS detector aspirator assembly	NA	20
VSP-016	12-relay Head termination card (if applicable)	50	20
VSP-018	Filter Switch Assembly	50	20
VSP-019	Filter Cover	NA	NA
VSP-100	Blank Plate with FOK LEDs and Logo	If applicable	If applicable
VSP-200	Blank Plate, EMC Painted, without Logo	If applicable	If applicable

Table 10 - Suggested spare parts stock

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